REMARKS

Applicant concurrently files herewith a Petition and Fee for One-month Extension of Time.

Claims 12-31 are all the claims presently pending in the application. Claims 15-31 have been added to claim additional features of the invention.

No new matter is added.

Applicant respectfully notes that the Examiner has rejected withdrawn claim 14. In the Office Action dated July 23, 2007, the Examiner made a restriction requirement, to which Applicant elected claims 12 and 13 without traverse in the Response dated August 20, 2007, and reserved the right to prosecute claim 14 at a later date. However, in order to properly respond to the Office Action dated November 16, 2007, Applicant assumes that *the Examiner has lifted the restriction requirement and is allowing prosecution on the merits with respect to claim 14*.

Applicant notes that the attached Exhibits are provided only to assist the Examiner in his understanding of the invention. The contents of the article should not be incorporated into the specification of the present Application and should not be construed as describing the claimed invention in any manner.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claim 12 stands rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Ichikawa et al. (Japanese Publication No. 2000-169918) in view of Inoue (Japanese Publication No. 54-067297). Claims 13 and 14 stand rejected under 35 U.S.C. § 103(a) as being allegedly

unpatentable over Ichikawa in view of Inoue as applied to claim 12, and further in view of Komata (Japanese Publication No. 57-070244).

These rejections are respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

An exemplary aspect of the claimed invention (e.g., as recited in claim 12) is directed to a process for producing an ultrafine copper alloy wire that includes melting a high-purity copper having a total unavoidable impurity content of not more than 1 ppm by mass in a carbon crucible installed in a vacuum, replacing an atmosphere surrounding the melted copper by an argon gas atmosphere and adding 1.0 to 5.0% by mass of silver having a purity of not less than 99.99% by mass to the copper, casting the copper with silver added thereto in a carbon mold into a wire rod, and drawing the wire rod to a diameter of not more than 0.08 mm.

Conventional ultrafine wires are manufactured to be used in conventional cables having standard diameters in order to include an increased amount of wire cores in conventional cables. However, conventional ultrafine wires have had significant issues with breakage, specifically as a result of foreign material inclusion and ductile fracture. Some conventional ultrafine wires have attempted to solve this problem by limiting the amount of foreign material which makes up the wires. However, even when foreign materials in conventional ultrafine wires are limited to a certain amount, wire breakage during wire drawing still occurs when the amount of foreign materials included in the conventional wires comes close to the limited amount (Application at page 1, line 17 to page 3, line 24).

An exemplary aspect of the claimed invention, on the other hand, may include a process for producing an ultrafine copper alloy wire that includes melting a high-purity copper having a total unavoidable impurity content of not more than 1 ppm by mass in a carbon crucible installed in a vacuum and casting the copper with silver added thereto in a carbon mold into a wire rod

(Application at page 9, lines 11-21). This may provide a process for producing an ultrafine copper alloy wire in which the resultant ultrafine copper alloy wire possesses excellent tensile strength, wire drawing properties, and bending properties (Application at page 7, lines 17-20).

II. THE PRIOR ART REJECTIONS – The Ichikawa, Inoue, and Komata References

The Examiner alleges that Ichikawa and Inoue can be combined to make the claimed invention obvious. The Examiner also alleges that Ichikawa and Inoue can be further combined with Komata to make the invention of claims 13 and 14 obvious.

Applicant respectfully disagrees. Indeed, none of these references – either alone or (arguendo) in combination with one another – teaches or suggests a process for producing an ultrafine copper alloy wire comprising "*melting a high-purity copper having a total unavoidable impurity content of not more than 1 ppm by mass in a carbon crucible installed in a vacuum . . . [and] . . . casting said copper with silver added thereto in a carbon mold into a wire rod*", as recited, for example, in claim 12 (Application at page 9, lines 11-21).

According to the claimed invention, the carbon crucible and the carbon mold are used because a major part of foreign material included during melting and casting is accounted for by SiC, SiO_2, and ZrO_2. These foreign materials are components of ceramics and cement use in the crucible or the mold. They are separated from the crucible or the mold and included in the melt during the melting or molding process, as described on page 9, line 22 to page 10, line 1 of the Application. By preventing the inclusion of the foreign materials such as SiC, SiO_2, and ZrO_2, it is possible to suppress the breaking of the ultrafine copper alloy wire due to the interfusion of the foreign materials.

Ichikawa discloses an extremely thin copper alloy wire (Ichikawa at Abstract). The Examiner admits that Ichikawa fails to disclose or suggest the casting atmosphere. Applicant respectfully submits that Ichikawa also fails to disclose or suggest the material of the crucible

and mold. In fact, Ichikawa clearly fails to teach or suggest in its entirety a crucible or a mold. Therefore, Ichikawa clearly fails to disclose or suggest the carbon crucible and carbon mold of the claimed invention.

Inoue discloses the conventional steps of forming a Zr-Cu alloy containing 10 weight% added to a Cu melt in an atmosphere of inert gas or reducing gas (Abstract). The Examiner alleges that the Abstract of Inoue makes up for the deficiencies of Ichikawa with regard to the casting atmosphere.

However, like Ichikawa, Inoue fails to disclose or suggest the material of the crucible and mold. In fact, Inoue clearly fails to teach or suggest in its entirety a crucible or a mold. Therefore, Inoue clearly fails to disclose or suggest the carbon crucible and carbon mold of the claimed invention used for casting the Cu material.

Thus, the alleged combination of Ichikawa and Inoue clearly fails to disclose or suggest the claimed invention. Therefore, claim 12 is patentable over the Examiner's alleged combination

Regarding claims 13 and 14, Komata discloses a Cu-based alloy including a Cu-Ag alloy and Mg or In (Komata at Abstract). The Examiner alleges that Komata makes up for the deficiencies of the alleged Ichikawa and Inoue combination in order to make the invention of claims 13 and 14 obvious.

However, like Ichikawa and Inoue, Komata fails to disclose or suggest the material of the crucible and mold. In fact, Komata clearly fails to teach or suggest in its entirety a carbon crucible used for melting the Cu material, or a carbon mold for casting the Cu material.

Komata actually teaches away from the invention of claims 13 and 14. Komata teaches on page 2, left upper column, line 19 to right upper column, line 1 that a graphite (black-lead) crucible is used for melting Cu, after which a melt surface is covered by charcoal powder, respective additive elements are added, and the graphite crucible is cast. A crucible made of

graphite with clay is a typical container for melting metals, as is shown by Exhibit A, http://en.wikipedia.org/wiki/Crucible.

Further, the graphite crucible generally includes Carbon and SiC, as shown in Exhibit B, http://www.rutsubo.com/e/products/n_f/phoenix/main.html. The SiC elements dissolved into the melt are foreign materials that may deteriorate the drawing property of the ultrafine copper alloy wire.

In addition, in Komata, the melt surface is covered by charcoal powder. The charcoal powder is generally provided for preventing the oxidation of the melt, since the charcoal easily reacts with the oxygen in the atmosphere. Therefore, it is assumed that the melting of Cu by using the graphite crucible is conducted in the atmosphere and *not* in the vacuum.

On the other hand, in the claimed invention, an impurity, such as SiC, is not added to the carbon crucible. Therefore, if the carbon crucible is exposed to a high temperature in the atmosphere, then the carbon will be oxidized. As a result, the carbon crucible is consumed and cannot be used. Based on this fact, it is further assumed that the graphite crucible of Komata includes SiC.

Komata clearly fails to disclose or suggest the carbon crucible, or the carbon mold of the claimed invention. Thus, the alleged combination of Ichikawa, Inoue, and Komata clearly fails to disclose or suggest the use of the carbon crucible and the carbon mold as well as the breaking of the ultrafine copper alloy wire due to the interfusion of SiC, SiO_2, and ZrO_2, or the like that is a component of the crucible or the mold.

Further, the Examiner fails to even specify what portion of Komata is relied upon to reject the invention of claims 13 and 14. The Examiner also fails to even mention a carbon crucible or a carbon mold in the discussion providing support for any of the rejections. Applicant would remind the Examiner that 37 C. F. R. 1.104(b) provides that "[t]he Examiner's action will be complete as to all matters" (emphasis added), and more particularly, 37 CFR 1.104(c)(2) requires

that when the Examiner rejects a claim for lack of novelty or obviousness, "the particular part relied on must be designated" by the Examiner (emphasis added). In addition, MPEP §707.07 provides that "[w]here a claim is rejected for any reason related to the merits thereof it should be 'rejected' and the ground of rejection fully and clearly stated" (emphasis added). In this case, the Examiner has NOT designated the particular part of the reference relied on in rejecting the claims and is incomplete.

Therefore, it would not have been obvious for those skilled in the art to provide the claimed invention or the invention of claims 13 and 14 in view of the cited references. Further, the unexpected effect explained above is obtained by the claimed invention and is not taught or suggested by the Examiner's prior art references. As such, Applicant respectfully requests the Examiner to reconsider and withdraw all rejections.

III. NEW CLAIMS

New claims 15-31 have been added to claim additional features of the invention and to provide more varied protection for the claimed invention. These claims are independently patentable because of the novel and nonobvious features recited therein.

Applicant submits that the new claims are patentable over the cited prior art references at least for analogous reasons to those set forth above with respect to claims.

IV. FORMAL MATTERS AND CONCLUSION

The Examiner is requested to acknowledge receipt of the priority documents filed on March 12, 2001.

In view of the foregoing, Applicant submits that claims 12-31, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition

for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: March 17, 2008

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Exhibit A

Crucible

From Wikipedia, the free encyclopedia

A **crucible** is a cup-shaped piece of laboratory equipment used to contain chemical compounds when heating them to very high temperatures. Crucibles are available in several sizes and typically come with a **crucible cover** (or lid).

Crucibles used in Czochralski method

Contents

- 1 Crucible materials and description
- 2 Use in chemical analysis
  - 2.1 Use in ash content determination
- 3 See also
- 4 External links

Crucible materials and description

Crucibles and their covers are made of high temperature-resistant materials, usually porcelain or an inert metal. One of the earliest uses of platinum was to make crucibles. More recently, metals such as nickel and zirconium have been used. The lids are typically loose-fitting to allow gases to escape during heating of a sample inside. Crucibles and their lids can come in high form and low form shapes (see Ext. Link 2 below) and in various sizes, but rather small 10–15 ml size porcelain crucibles are commonly used for gravimetric chemical analysis. These small size crucibles and their covers made of porcelain are quite cheap when sold in quantity to laboratories, and the crucibles are sometimes disposed of after use in precise quantitative chemical analysis. There is usually a large mark-up when they are sold individually in hobby shops.

A crucible is also a container in which metals are melted, usually for temperatures above 500 °C. These crucibles are usually made of graphite with clay as a binder. These crucibles are very durable and resist temperatures to over 1600 °C. A crucible is placed into a furnace and, after the melting, the liquid metal is taken out of the furnace and poured into the mold. Some furnaces (usually electric or induction) have an embedded crucible and are tilted when the metal is poured out.

Crucible after being used

Use in chemical analysis

In the area of chemical analysis, crucibles are used in quantitative gravimetric chemical analysis (analysis by measuring mass of an analyte). Common crucible use may be as follows. A residue or precipitate in a chemical analysis method can be collected or filtered from some sample or solution on special "ashless" filter paper. The crucible and lid to be used are pre-weighed very accurately on an analytical balance. After some possible washing and/or pre-drying of this filtrate, the residue on the filter paper can be placed in the crucible and fired (heated at very high temperature) until all the volatiles and moisture are driven out

of the sample residue in the crucible. The "ashless" filter paper is completely burned up in this process. The crucible with the sample and lid is allowed to cool in a desiccator. The crucible and lid with the sample inside is weighed very accurately again only after it has completely cooled to room temperature (higher temperature would cause air currents around the balance giving inaccurate results). The mass of the empty, pre-weighed crucible and lid is subtracted from this result to yield the mass of the completely dried residue in the crucible.

Melting gold in a graphite crucible

A crucible with a bottom perforated with small holes which is designed specifically for use in filtration, especially for gravimetric analysis as just described, is called a **Gooch crucible** after its inventor, Frank Austen Gooch.

Several graphite crucibles of different sizes

For completely accurate results, the crucible is handled with clean tongs because fingerprints can add weighable mass to the crucible. Porcelain crucibles are hygroscopic, i. e. they absorb a bit of weighable moisture from the air. For this reason, the porcelain crucible and lid is also pre-fired (pre-heating to high temperature) to constant mass before the pre-weighing. This determines the mass of the completely dry crucible and lid. At least two firings, coolings, and weighings resulting in exactly the same mass are needed to confirm constant (completely dry) mass of the crucible and lid and similarly again for the crucible, lid, and sample residue inside. Since the mass of every crucible and lid is different, the pre-firing/pre-weighing must be done for every new crucible/lid used. The desiccator contains desiccant to absorb moisture from the air inside, so the air inside will be completely dry.

Three crucibles used by Thomas Edison.

Use in ash content determination

Ash is the completely unburnable inorganic salts in a sample. A crucible can be similarly used to determine the percentage of ash contained in an otherwise burnable sample of material such as coal, wood, or oil. A crucible and its lid are pre-weighed at constant mass as described above. The sample is added to the completely dry crucible and lid and together they are weighed to determine the mass of the sample by difference. The crucible, lid, and sample are then fired to constant mass to completely burn up the sample, leaving behind only the completely unburnable ash. After cooling in dryness, the crucible, lid, and remaining ash are weighed to find the mass of the ash from the sample by difference.

See also

- Hessian crucible

External links

- Momentive Performance Quartz, Inc - Manufacturer of Quartz Crucibles (http://www.momentivequartz.com/en/crucibles.htm)
- Intellect Associates - Manufacturers & Exporters of Graphite Crucibles (http://www.intellectassociates.com/graphitecrucibles.htm)

- Metal Technology - a manufacturer of crucibles (http://www.b-jenterprises.com/scientific_labratoryProducts.php)
- CR-Scientific: Catalog: Porcelain ware & accessories: Crucibles (http://www.crscientific.com/porcelainware.html) shows picture of 10 ml high form and 15 ml low form porcelain crucibles and lids.

Retrieved from "http://en.wikipedia.org/wiki/Crucible"
Categories: Laboratory equipment | Alchemical tools | Laboratory porcelainware | Analytical chemistry

Exhibit B

Graphite carbon-siliceous crucibles

PHOENIX Series

- Reliable technology cultivated through research and development over the years
- Broad product line for a wide variety of applications
- The product group is available in various shapes and sizes, allowing customers to select their desired products for a specific environment.

Nippon Crucible has gained great popularity with its original technology accumulated over a century since its foundation in 1885 as the first graphite crucible manufacturer in Japan, meeting a wide variety of user needs today.
As the demands for higher quality, yield, and reliability of non-ferrous metal products have been growing in recent years, the operating conditions of graphite crucibles have increasingly been getting more diverse and severe. Thus, more stable use or higher durability of graphite crucibles is desperately wanted.
To meet these demands, Nippon Crucible introduced the Cold Isostatic Press production system for improved quality assurance system. It also developed a new graphite crucible product called SUPER PHOENIX HP with substantially improved quality. The new product has proven its more stable, longer service life.

■Features

1. Spalling resistance:
   Extremely resistant to rapid heating and cooling without spalling.
2. Erosion resistance:
   Extremely resistant to metal or flux errosion with its uniform and dense structure.
3. Thermal Shock resistance:
   With the high cold and heat strengths, the product can be handled worry-free.
4. Oxidization resistance:
   The improved base material and the newly developed special glaze provide the excellent oxidization resistance and remarkably longer service life.
5. High heat resistance:
   The high percentage of fixed carbon makes the material easily conduct heat, ensuring shorter melting time and better fuel economy.
6. No metal contamination:
   The base material has been strictly selected, causing no metal contamination in the melting process.
7. Stable quality:

The Cold Isostatic Press production system and the improved quality assurance system maintain stable product quality.

■Physical properties

Apparent Porosity	:	18～24%
Bulk specific gravity	:	1.80～2.10
Thermal conductivity	:	19.8～52.3W/(mk) [17～45kcal/mh°C]
Specific electric resistance	:	1.5～6×10^{-3}[] cm
Modulus of rupture	:	6.9～17.7MPa [70～180kgf/cm^2](at R.T.)
		4.9～13.2MPa [50～135kgf/cm^2](at 1200°C
Weight loss by oxidation	:	<1.0%(at 850°C×24hrs)
Thermal expansion	:	0.25～0.35%(at 800°C)

■Chemical composition

Carbon	:	30～55%
SiC	:	30～50%

■Various shapes of product


Standard type


Long type


High type


Spout type


Electric furnace type


HA type


PB type


PA type


Horizontal continuous casting type


Crucible stand

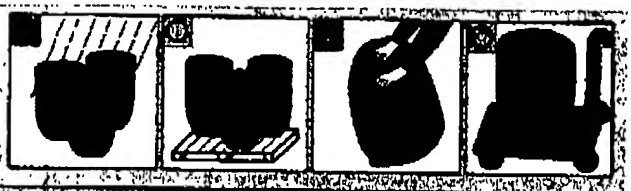

Ladle Bowl


Runner Brick

press for catalog information

■Precautions for crucible use

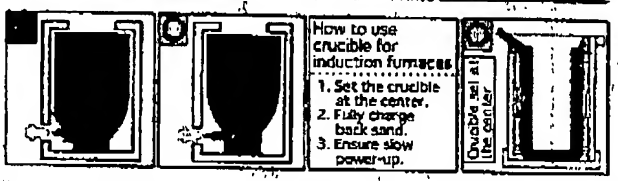
1.
Store and transport the product carefully.



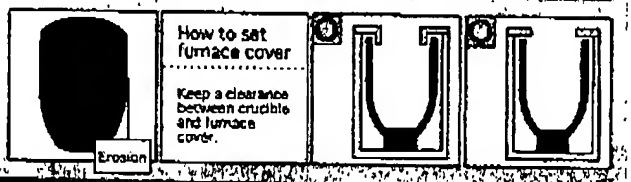
2.
Use a crucible stand of the same diameter of the bottom of your crucible at the proper position.

3.
Charge ingots into the crucible with care. Do not wedge ingots.

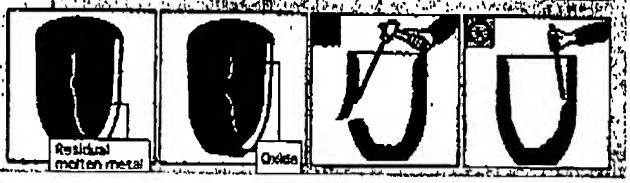
4.
Do not subject the crucible to the direct flame contact.



5.
Use only minimum amount of flux.



6.
Exercise much care to avoid residual molten metal and oxide deposit. These may break the crucible.



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